CHEMISTRY LETTERS, pp. 1993-1994, 1994.

Temperature Dependence of Reflectivity in $MnSr_{0.7}Ca_{0.3}O_3$

Masanori KURODA and Kiyoshi YOKOGAWA
Chugoku National Industrial Research Institute, MITI,
Hiro-Suehiro, Kure, Hiroshima 737-01

We measured the temperature dependence of the optical reflection spectrum of $MnSr_{0.7}Ca_{0.3}O_3$, which was prepared by the solid reaction method. It was found that the compound showed distinct optical spectrum change in the cryogenic temperature.

Recently manganese compound has attracted much interest concerning high-Tc cupurate superconductor.[1] We prepared several Mn compounds,[2] and tested their cryogenic properties. We measured the optical reflection spectrum of $MnSr_{0.7}Ca_{0.3}O_3$ in a range from 11 to 270 K using grating double monochromator JASCO CT-25CD and scanning controller CMD-50C. The compounds were prepared by the conventional solid state reaction method. The raw materials were manganese carbonate, calcium carbonate and strontium carbonate. A stoichiometric amount of raw material was mixed and calcined in an alumina crucible at 950 ℃. The compound was sandwiched between quartz plates and set in the cold head of the cryostat. The temperature dependence of the reflection spectrum is shown in Fig 1. The reflectance was distinctly changed in a wavelength range from 600 to 700 nm with decreasing of the temperature. It was found that the compound showed distinct optical spectrum change in the cryogenic temperature. In Fig. 2 temperature dependence of reflectance at 620 nm is shown. The reflectance at 620 nm gradually increases with the decrease of the temperature.

Negas et al.[3] reported that $MnSrO_3$ had a four layer structure. Chamberland

et al.[4] reported that a four-layer hexagonal structure of SrMnO did not obey the Curie-Weiss Law. We confirmed that $MnSr_{0.7}Ca_{0.3}O_3$ had the four-layer hexagonal structure with the lattice parameters a=0.544 nm and c=0.908 nm.

The reason that this compound shows an optical spectrum change is not clear. It was reported that $MnSrO_3$ compound had Mn^{4+} and Mn^{3+}.[3] The optical spectrum change of $MnSr_{0.7}Ca_{0.3}O_3$ may be related to the mixed oxidation states. However, further investigation is needed to solve this problem.

We would like to express our thanks to Dr. T. Hashimoto(Kyoto University of Education), Dr. M. Araki and General Manager of H. Yokogawa for their support and helpful discussion throughout this study.

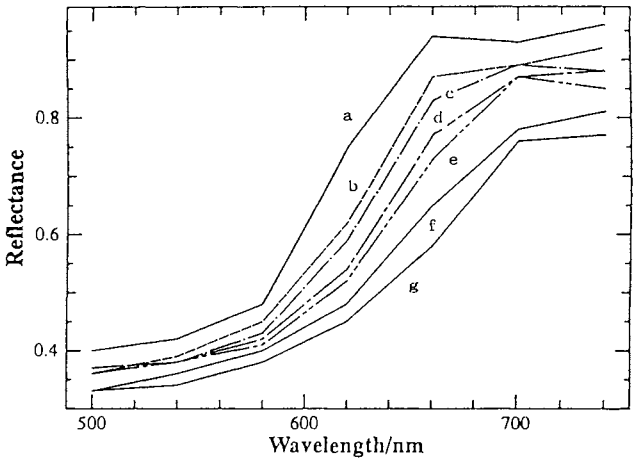

Fig. 1. Optical reflection spectrum of $MnSr_{0.7}Ca_{0.3}O_3$
a;40 K, b;77 K, c;95 K, d;135 K,
e;160 K, f;200 K, g;235 K.

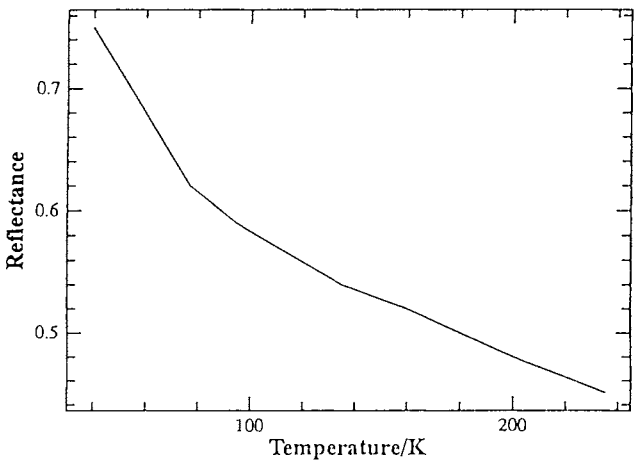

Fig. 2. The temperature dependence of the reflection intensity at 620 nm.

References

1) M. Kasai, T. Ohno, Y. Kanke, Y. Kozono, M. Hanazono, and Y. Sugita, *Jpn. J. Appl. Phys.*, **29**, L2219 (1990).

2) M. Kuroda and M. Araki, U.S. Patent 5165797 (1992).

3) T. Negas and R. S. Roth, *J. Solid State Chem.*, **1**, 409 (1970).

4) B.L. Chamberland, A.W. Sleight, and J.F. Weiher, *J. Solid State Chem.*, **1**, 506 (1970).

(Received July 11, 1994)